

## EXAMINATION OF HANDWRITTEN DOCUMENTS OF UNFAMILIAR SCRIPTS: A FORENSIC VIEWPOINT ON VARIOUS INDIAN LANGUAGES

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### ABSTRACT

Whether a forensic document examiner should express an opinion regarding authorship on the handwritten documents of unfamiliar language has been a matter of debate since the very origin of science. There is a clear division among the experts of the discipline of whom some are in favour of rendering opinion and the rest strongly against it. The consideration further complicates when this question is raised in a scenario like that of Indian linguistic diversity, where an examiner generally familiar with a single language is upto the challenge of examining documents of more than 18 languages, each of them incredibly different from the others.

Thoroughly evaluating the possibilities and limitations via examining 50 such documents pronouncing their link to 10 different Indian scripts- Bangla, Gujarati, Marathi, Tamil, Telugu, Malayalam, Punjabi, Oriya, Assamese & Urdu, the authors strongly endorse the inspiration of examination of these unfamiliar scripts and rendering a conclusive opinion by the document experts. The manuscript clearly outlines what it requires to successfully examine this special class documents and how such conscientious efforts smoothens the process of administration of justice.

**KEYWORDS:** Forensic, Document, Examination, Handwriting, Unfamiliar, Scripts, Languages

### INTRODUCTION

Forensic document examiners usually encounter the questioned documents bearing text in their own script, i.e., the one they are familiar with. Consequently, they face little or no difficulty in recognizing the letters or words or symbols or figures or any peculiar feature specific to the script under consideration which has been used to synthesize the text that has come for examination. A conclusive opinion after careful examination of such writing is highly expected leave alone the degree of accuracy of the opinion as it can vary with the available expertise and suitability and adequacy of the standards for comparison. Familiar and easily readable text fastens the process of examination to certain extent unable to negate the fact that amount of time consumed in any examination depends largely on the visible characteristic general and individual features of the writing and the nature of the query forwarded by the investigating agency.

They can refer to their experience for evaluating variations or dissimilarities found within the writings of languages familiar to them. A greater difficulty arises when the writings in unfamiliar languages are encountered. In such situation the large majority of experts may generally deny to undertake the examination. They believe it is more appropriate to refer such examinations to experts familiar with the foreign system of writing or who have dealt with similar matters previously [1]. Suspicion regarding the validity and accuracy of the examination and opinion may also arise as to

how a person can correctly analyse the handwriting characteristics of a document without having any knowledge of the particular script in question.

For a document examiner whose native language is Hindi, examination of handwritings that uses unfamiliar alphabets derived from the languages or scripts unknown to him is difficult, but he is aware of the various forms of the letters which are currently used. It is true that, the expert who knows a particular language stands in more advantageous position than the one who does not know it, but as the expert he should not confine himself to any single factor and has to examine and scrutinize the various writing habits such as, speed, skill, movement, pen pressure etc. while analyzing writings [2].

He is therefore able to assess how characteristic are the features he finds in the writing he examines and this assists him in the reaching a conclusion [3]. Thus, with the assistance of the language guide book and the person having the knowledge of the particular language or script, the study of such samples could be carried out. The examination of such writings can also be facilitated by clearly writing the interpretation or meaning of each formation just above it. This will reduce the possibility of erroneous reading of the writing [4]. The numerals can be effectively used as a discriminating element for identification of a person's handwriting and to fix authorship of disputed writings. Formation of numerals varies from writer to writer in structure, dimensions, slope, spacing, size, style and shape [5-6].

It is observed that a conclusion drawn in regard to disputed unfamiliar writings depends upon the problem to be solved, and the nature of the writing in dispute. If the principles of examination are carefully followed and applied by a persevering enquirer, it is highly possible that a correct solution can be reached in the vast majority of investigations [7-8].

This work presents, the samples studied as examples of methods for examining and analysing the handwritten unfamiliar Indian languages and scripts. 50 samples in 10 languages, collected from 50 different writers, were studied, including-Bangla, Gujarati, Urdu, Malayalam, Assamese, Punjabi (Gurumukhi script), Telugu, Tamil, Oriya, Marathi, in order to find out the peculiar and individual writing characteristics and to determine whether a forensic document examiner should express an opinion on the handwritten documents of unfamiliar scripts after a thorough examination and comparison.

## METHODOLOGY

The handwritten samples were collected from different writers of 10 different Indian languages. We grouped our 10 Indian languages in two groups viz:

- Those having close resemblance with the Hindi language including Gujarati, Marathi, Punjabi (Gurumukhi script), Bangla, Oriya and Assamese.
- Those which shows great divergence from the Hindi language or Devanagri script, which includes Tamil, Telugu, Malayalam and Urdu.

A total of 50 samples were collected from all 10 languages taken together. Table 1 shows the number of handwriting samples collected from each script.

**Table 1: Details of Sample Collection**

Languages resembling with Hindi		Languages different from Hindi	
Languages	No. of samples collected	Languages	No. of samples collected
Bangla	5	Tamil	5
Gujarati	5	Telugu	5
Marathi	5	Malayalam	5
Oriya	5	Urdu	5
Assamese	5		
Punjabi	5		

The 50 writers knowing the above languages were selected to provide samples in their own language for examination. They were given a standard text in Hindi with a request to translate and write it in their own language. The contents of this standard text varied from language to language but were same for the writers of a particular language. It was given a due consideration that the people whose handwriting samples were being collected were well conversant with the particular language to maintain the validity, accuracy and reliability of the dissertation report. The so collected samples were then examined and analysed by applying the principle of handwriting examination for determination of their:-

- Overall pictorial appearance
- General writing characteristics
- Individual writing characteristics
- Similarities and closeness between different scripts
- Different alphabets of each script
- The commonest form of the letter and its rare variants

During the course of examination, comparison and analysis of samples, bulk of focus was on the individual writing characteristics which includes –

- Formation of letters
- Shape of letters
- Combinations of letters
- Simplifications
- Their start and finish
- Relative location of the strokes forming the letters and their combinations

- Direction and curvature of strokes
- Length, direction and angularity of strokes
- Extent of retracing
- Formation of loops, its size, shape and inclination
- Nature and extent of small hooks, if present, at the beginning and end of the strokes
- Slant of the diagonal and connecting strokes
- Uniformity or irregularity of the height of the letters in words.

Knowledge of the forms of alphabets and how the characters are formed is essential while dealing with the handwriting examination and particularly when the written material is unfamiliar. It poses difficulties even to a trained document examiner to recognise the characters and words and to make an accurate comparison. To overcome this difficulty, various books on different languages were consulted having bilingual features demonstrating the Hindi alphabets and the corresponding alphabets of particular script side by side. Assistance was also taken from the competent people, who were familiar with the language in question.

## EXPERIMENT & OBSERVATION

Firstly, those languages which closely resembled Hindi, were examined which includes – Gujarati, Marathi, Punjabi (Gurumukhi script), Bangla, Oriya and Assamese. After that the languages of other group consisting of – Tamil, Telugu, Malayalam and Urdu which showed almost no similarity with the Hindi script were taken into account. Each sample of all the languages was examined individually to find its general and individual writing characteristics, habits present in each set and to determine the extent of deviation from the copy book form which formed the basis for fixing the authorship of any handwritten document of unfamiliar script. Let us consider one handwritten script of a Bangla writer (figure 1), which was thoroughly examined and each of its alphabet was compared with its standard book form.

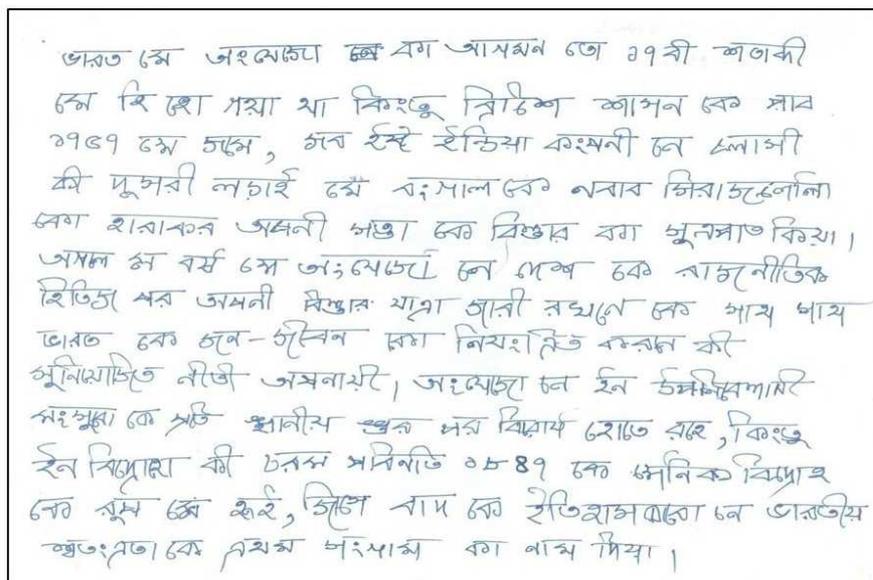


Figure 1: Writing in Bangla Script Collected from a Bengali Writer

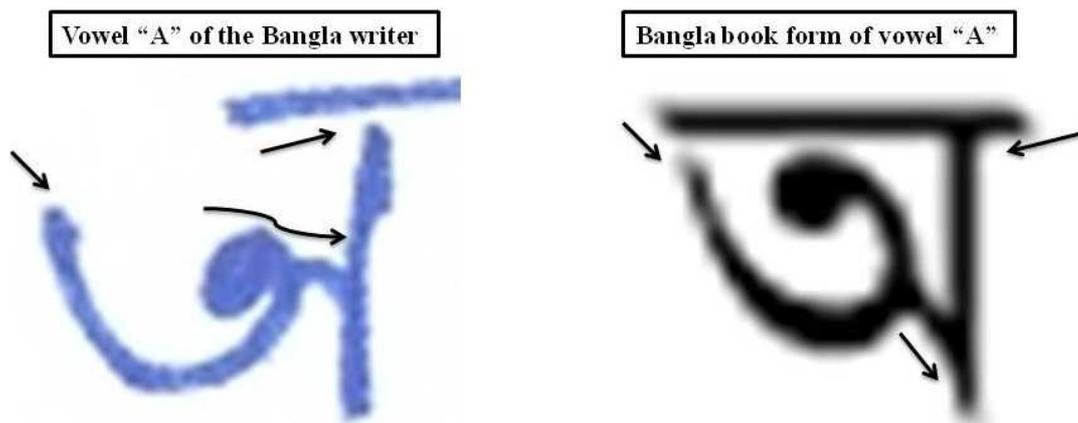
Letter construction, internal proportion of each letterform, ratio (height relationship), line quality, and arrangement of text, internal consistency within a set of writings are the some of the parameters which are taken into account. The general writing characteristics of the handwriting sample were recorded in form of observation chart as shown in Table 2.

**Table 2: Representation of General Writing Characteristics**

S. no.	Class Characteristics	Observation
1.	Line quality	Smooth and Uniform
2.	Movement	Wrist
3.	Speed	Medium
4.	Alignment	Horizontal
5.	Skill	Medium
6.	Slant	Vertical
7.	Size	Large
8.	Spacing	Normal

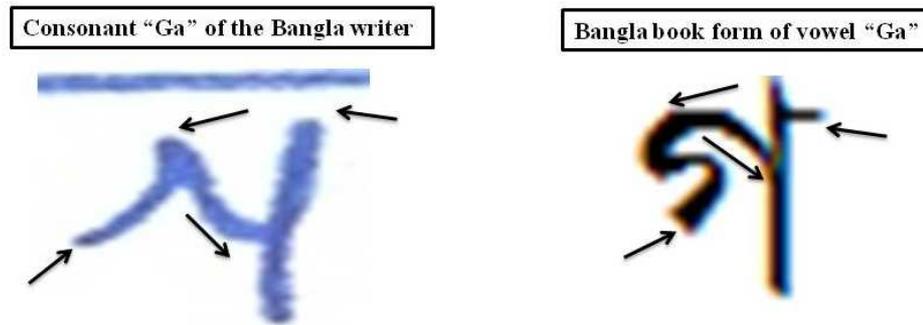
The table describes the general writing characteristics of a handwritten script of a Bangla writer in terms 8 different features including its line quality, movement, speed, skill, slant, alignment, size of the letters and spacing between words, letters and sentences.

The sample reflected some individual writing habit of the writer which had some characteristic deviations from the actual book form. Some of the examples are shown in figure 2 and figure 3.



The position and orientation of middle connecting stroke of vowel “A” differs from the book form. The formation of the vowel is continuous without any pen lifts. The writer is in the habit of leaving more space between the body of the vowel and the head stroke. The curved part of the vowel has a blunt start. The curve appears to be more horizontal in comparison to its book form.

**Figure 2: Variation Observed in Formation of Vowel “A” in the Bangla Script of the Writer When Compared with the Copy Book form**



Characteristic formation of letter 'Ga' with a diagonal appearance of the middle stroke different from its book form. The formation of the consonant is continuous without any pen lifts. The head stroke in the book form is formed by extending the upper part of the vertical staff of the letter. While the writer is in the habit of producing the extended head stroke some distance away from the body of the letter. The intersection of the initial and middle stroke of the letter is pointed. The initial stroke is larger with a sharp start as compared to the book form of the letter.

**Figure 3: Variation Observed in Formation of Vowel "A" Bangla Script of the Writer When Compared with the Copy Book form**

Similarly all writings written in different languages were examined and reported in the similar manner.

## RESULTS

Through the study and examination of the samples, and the observations thus obtained, the outcome states that the document examiner should not necessarily know the language which he or she is supposed to examine. It is very much possible for a document examiner to undertake the examination of a disputed document consisting of writings in any unfamiliar language or script and to render opinion thereon.

In this study, the examination of handwritten samples of 10 different languages- Bangla, Gujarati, Marathi, Tamil, Telugu, Malayalam, Gurumukhi, Oriya, Assamese, Urdu, was carried out by estimating their general and individual writing characteristics for arriving at a definite opinion regarding their authorship. All these writings show variations in their general writing characteristics among their samples, as shown in table 3, just like those in any familiar language.

**Table 3: General Writing Characteristics Marked While Examining all the Handwriting Samples from 10 Different Indian Scripts**

S.no.	Class Characteristics	Observation
1.	Line quality	Poor to smooth
2.	Movement	Finger to forearm and their combinations
3.	Speed	Slow to high
4.	Alignment	Horizontal
5.	Skill	Low to high
6.	Slant	Slightly backwards to forward, generally vertical
7.	Size and proportion of letters	Small to large
8.	Spacing	Narrow to Wide

The individual writing characteristics of all the samples were studied by taking the assistance of relevant books and persons familiar with the language in question. Similarities and dissimilarities were observed between the handwriting samples of different persons of same language in terms of formation of letters, shape of letters, and their combinations, simplifications, start and finish, relative locations of the strokes, direction of curvature of the strokes, extent of retracing, formation of loops, nature and extent of hooks and uniformity or irregularities in the height of the letters.

## CONCLUSIONS & DISCUSSIONS

After a careful and thorough examination of the handwritten samples of different unfamiliar Indian languages, we have reached to the conclusion that if the principles of handwriting examination are carefully followed and applied by a persevering forensic document examiner, it is very much likely that he will be able to examine the document successfully and can give a definite opinion thereon provided he is made available suitable and sufficient standard material for comparison. The document examiner, therefore, should not necessarily know the language which he is supposed to examine.

While analysing the writing, what is required is that the forensic document examiner should have made an intensive study of the manner in which the characters are made, so that he can follow correctly the sequence of each outline from beginning to end. Without such study it would be impossible for him to discover if a character were made the wrong way round.

If the questioned and the specimen writings which are sent for examination contains the same matter, it is comparatively easy for an expert, without knowing the script, to pick out the common letters or words or figures and appreciate the significant differences and similarities in their construction. But in such instances, where the subject matter for comparison is not the same, it becomes rather difficult for the expert to appreciate correctly the resemblances or differences in the formation of particular letters and in such cases the expert should preferably ask for similar text for comparison.

A document examiner without any knowledge of the script must compare like with the like, which requires knowing what each letter or figure is and where they occurs. He must be aware of what variations in the formation of a letter can occur in the writings of same persons and which forms are common or less common or rare. When the examiner has established where all the various letters occur in the writings he is examining and how these letters could be expected to differ among different writers, he can then apply the scientific principles of examination and observations with which he is certainly familiar.

Although the examiner can assume the letter formations are as variable as in his known language, he may have difficulty in recognizing certain letters or words of the unfamiliar language. In such a case, the examiner should take assistance from a language guide book or from a person well conversant with the script in question, which will be helpful and significant to solve the problem.

Only on the ground that the forensic document examiner does not know a particular language, he should not be considered incompetent for examining the disputed handwritten documents of any other language.

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